

Space Nutrition



Volume 3

ABCs: Acid - Base Chemistry

Issue 9

It's in the Numbers

Data collection is an important part of the scientific process. In fact, before research can be published, the science team must summarize their findings using statistics. The Biostatistics Laboratory (BL) helps NASA scientists plan their experiments so they can get the most information possible from the data they expect to gather. They also help the scientists find the best mathematical techniques for analyzing the data to see if their hypotheses are correct. Statisticians in the BL also conduct their own research to better understand the special challenges of using data collected from small numbers of human subjects in unusual environments. They also work with high school and college students and give them an opportunity to be directly involved in analyzing and interpreting biomedical research data at NASA.



Although we normally discuss exciting things about food, blood, or urine, in this issue we will take a closer look at the last 9 letters of "nutritional biochemistry." Chemistry is the study of matter and its changes. One important aspect of chemistry is called pH. pH is an acidity scale from 1 to 14, with pH 7 being neutral. Acidic substances have lower pH, and basic substances have higher pH.

Your body has a pH that can be measured in your blood. Several factors can affect the body's pH, including the food you eat. Some foods contain acid or base precursors, which can change the body's pH. Acid precursors do not necessarily have a low pH, but they do become acidic once they are broken down in the body. Likewise, base precursors become basic once they are broken down. In general, protein-rich foods (such as meats) contain lots of acid precursors. On the other hand, vegetables contain large amounts of base precursors.



Curiosity Corner

This month the Space Nutrition Newsletter features a poem by one of our readers on page 2. Her thoughtful words were inspired by the astronauts who bravely pursue the dream of space exploration.

If you would like to share your thoughts on how the space program has inspired you, please write to:

Space Nutrition Newsletter
Nutritional Biochemistry Laboratory
Mail Code SK3
NASA - Johnson Space Center
Houston, TX 77058



We just finished doing an experiment in which we found that people who eat a lot of acid precursors (without a lot of base precursors) during bed rest have more chemical breakdown of their bones than people who don't eat as many acid precursors. This is yet another reason why it is important for astronauts to eat a healthy, balanced diet - and for you, too! Did we mention that vegetables are a good source of base precursors? Keep eating those greens!

Did you know?

- The body has to maintain pH in a very narrow range to keep you healthy. Most body systems work best at a pH near 7.4.
- Buffers are chemicals that can neutralize acids or bases. One of the body's buffering systems is the bicarbonate-carbonic acid system. This system buffers the body's pH by converting carbonic acid to carbon dioxide. The carbon dioxide can then be removed from the body through respiration (breathing).
- Bones are a very big source of the bicarbonate buffer supply in your body. Therefore any changes in the pH of your body can greatly affect bone.
- The ability of a food to change your body's pH does not depend on the pH of the food itself. For example, if you drink lemonade (which is very acidic), your body pH will not decrease because your body can break down the acids in lemonade.



Word of the Month

Artificial

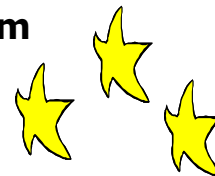
Can you guess what this word means? Look for the meaning of the "Word of the Month" in the next issue of Space Nutrition.

Beyond a Dream

by Sandy Kreager



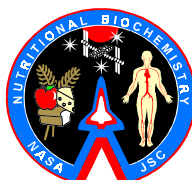
Have you ever thought beyond a dream
It's a very curious thing
Is the moon so tired? She looks so pale
Within her shiny veil
She scales the sky from east to west
And never takes a rest
Beyond the realism of time and space
Does someone hold a smiling face
If I could travel beyond a dream
I know it will be a unique thing
Would it be worth it
Just to go in an orbit
Up past the sky and become a spy
Would it be possible to do the impossible
And watch the crowds of clouds
Drown into shrouds
Could I feel even if it's not real
Would it be it, but that wouldn't fit
Or an illusion that's full of confusion
Have you ever dreamed beyond a dream
It's beyond a dreamer's dream



Check out these cool NASA links
for more fun space science facts!



<http://haco.jsc.nasa.gov/biomedical/nutrition/kids.shtml>
<http://edspace.nasa.gov/earthcrew/webcastarchive.html>
<http://www.spaceflight.nasa.gov>



Check out the Nutritional Biochemistry
Laboratory's website for more
information about nutrition and space.

<http://haco.jsc.nasa.gov/biomedical/nutrition/>